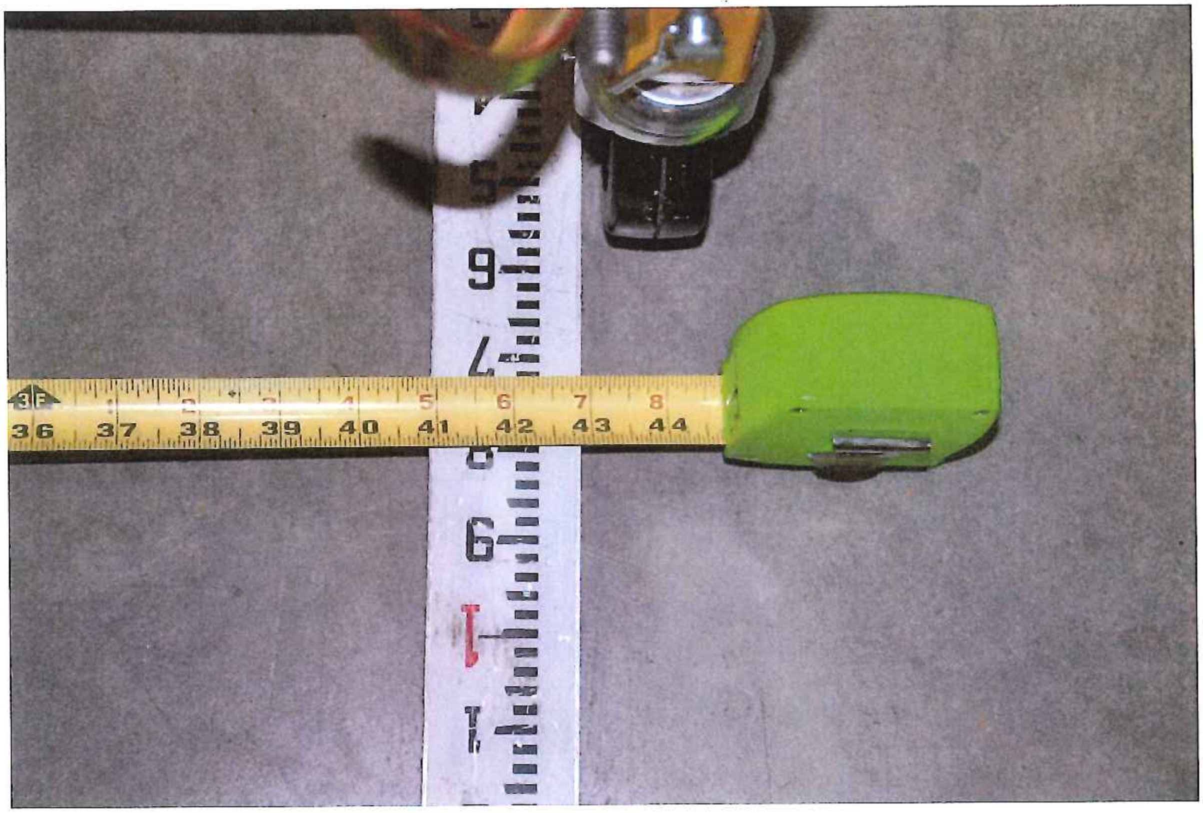
EXHIBIT "C-2"



Test 7 replicated the conditions of test 6, but with ladder 2 substituted for ladder 1. The upper extension J-locks were placed into a false lock condition in the same way as they were for test 6. The climber successfully ascended and descended the ladder without the false locked J-locks releasing.

Test 8 replicated test 7. During this test, the upper extension did descend, causing the climber to fall from the ladder. The climber's foot did not become caught between the lowest rung of the extension and the rung below it.

Test 9 once again repeated tests 7 and 8 with all parameters keep the same. The upper extension fell as the climber was attempting to dismount the ladder onto the scaffold platform, causing the climber to fall from the ladder.

Test 10 replicated tests 7 through 9, with ladder 3 substituted for ladder 2. During his ascent, when the climber's left foot was placed on the lowest rung of the upper extension, the false locked J-locks released. This caused the upper extension to descend and trap the climber's right foot, in similar fashion to test 6. The climber fell, bringing the ladder with him.

Test 11 replicated test 10, with ladder 4 substituted for ladder 3. Here again, the upped extension fell when the climber placed his left foot on its lowest rung, trapping his right foot. However, the climber was able to remain on the ladder.

Test 12 repeated test 11. The climber successfully ascended the ladder without the upper extension falling.

Test 13 replicated tests 11 and 12, with ladder 5 substituted for ladder 4. The upper extension did not fall.

Test 14 repeated test 13. The upper extension fell prior to the climber reaching it.

Test 15 repeated tests 13 and 14. When the climber placed his foot on the lowest rung of the upper extension, the extension descended, causing the climber to fall.

After the 15 climbing tests investigating false lock conditions were completed, the climber made the following observations:

> During each climb, the ladder behaved normally until the false lock released and the upper extension fell.
>
> The upper J-locks appeared engaged despite the fact that they were false locked.

After test 6, subsequent releases of the false locks and the associated fall of the upper extension failed to surprise the climber. This behavioral change is addressed in depth in the expert report of Dr. Peter Francis.

A second phase of testing comprised of three tests was conducted after the completion of the first 15 tests described previously. This test series examined the probability of the exemplar ladder sliding out if it were placed at a shallower angle than 75 degrees. The floor of the facility where the tests were performed is concrete.

The set-up angles of the exemplar ladder for the three tests were 60 degrees, 56.6 degrees and 53.6 degrees. The ladder was once again placed against the edge of the same scaffold platform utilized during the previous tests. In all three tests, the ladder failed to slide out during either the ascent or descent of the climber.

Next, the exemplar ladder was placed against the edge of the scaffold platform at an angle of 75 degrees, with all of the J-locks completely engaged. The climber ascended the ladder and then reached to his right, placing his center of gravity outside the right rail. The behavior of the climber and the ladder were observed. As the climber fell from the ladder to the right, the ladder tipped over to the left.

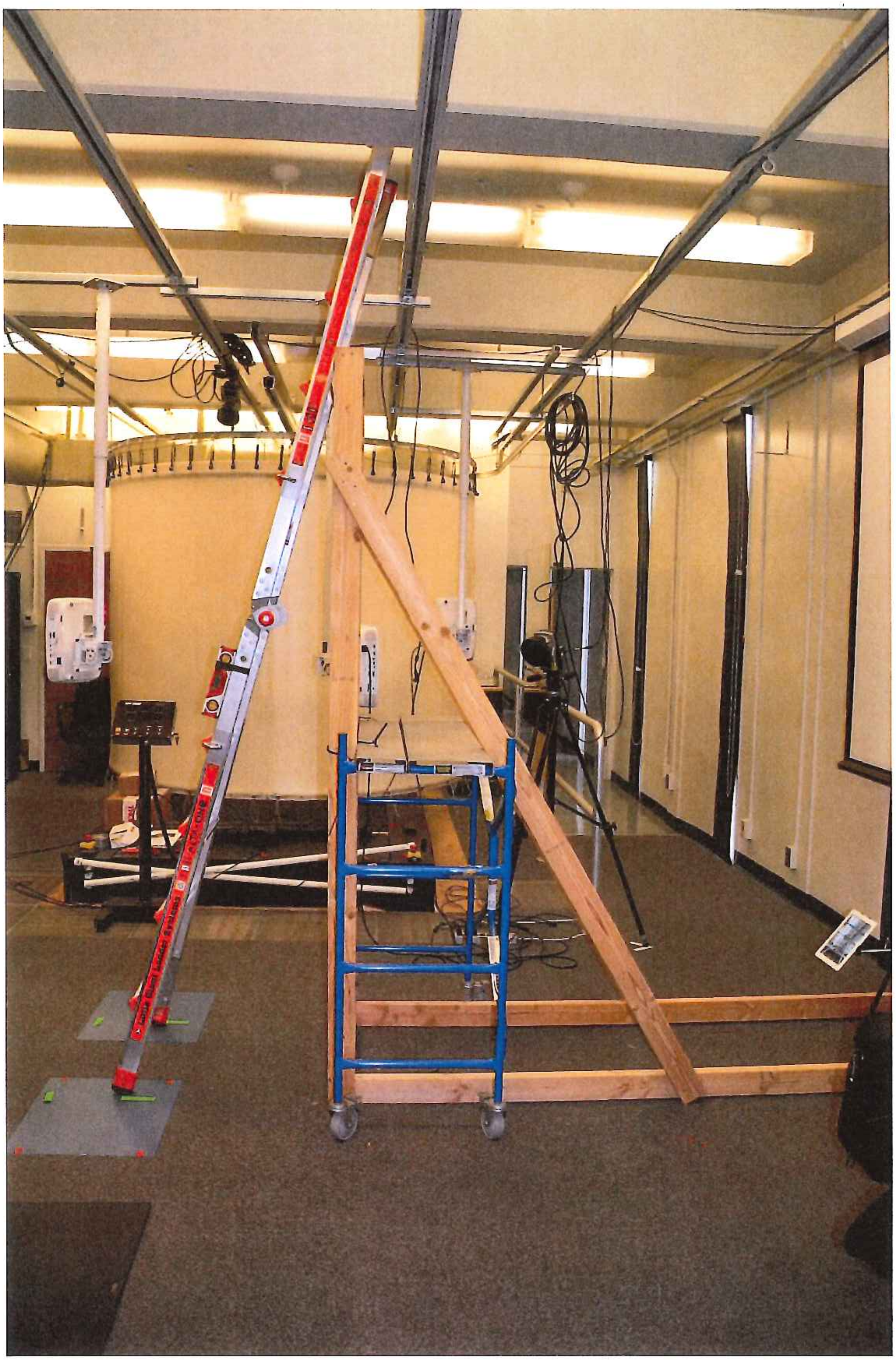
Upon completion of the tests discussed above, the forces required to hold the J-locks open on each of the five exemplar ladders and the artifact ladder were measured using a digital force gage. The following forces were recorded (measurements in ounces):

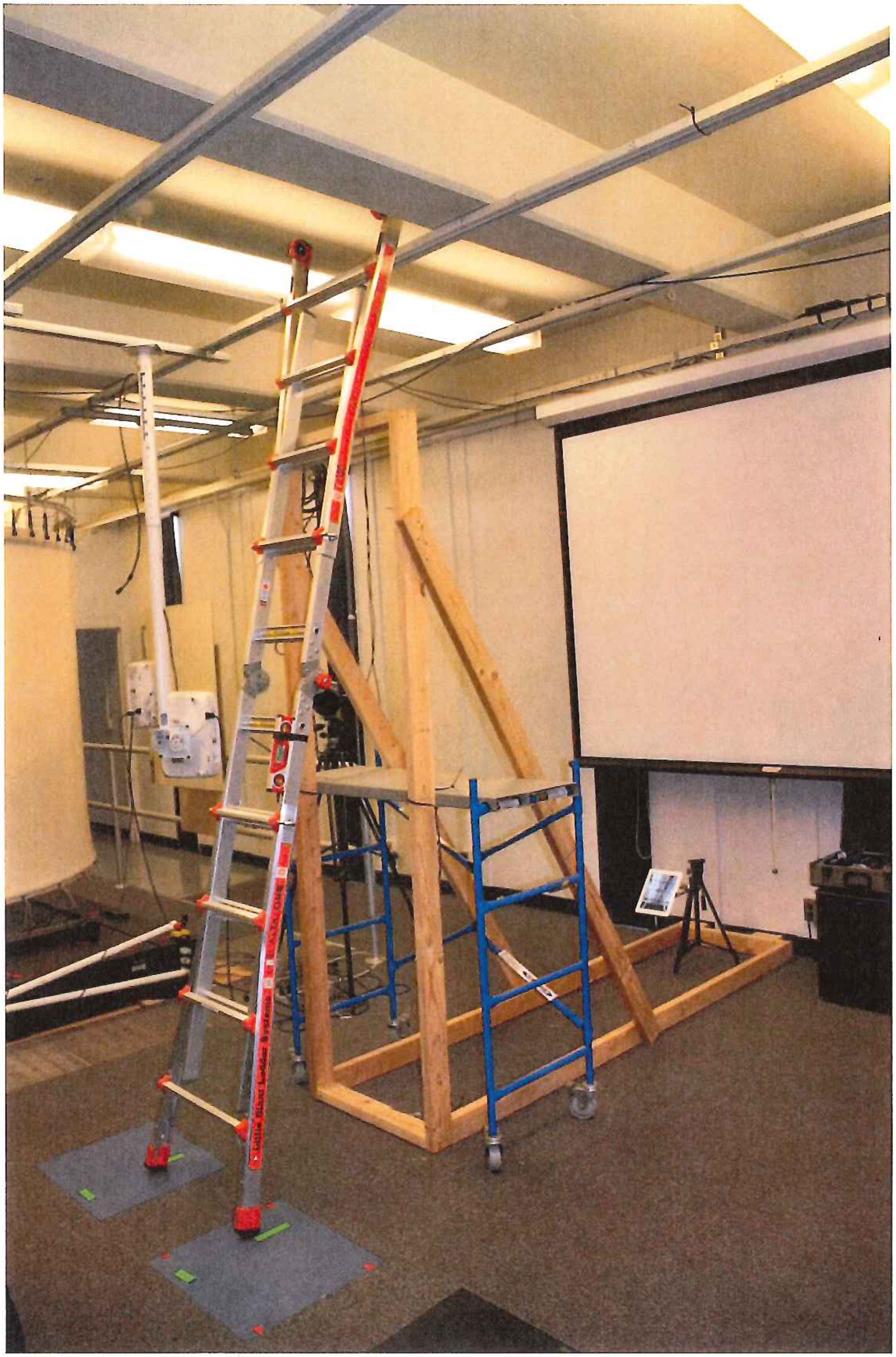
Ladder 1:	Upper Left:	99.80	97.50	97.55
	Upper Right:	82.80	78.80	92.75
	Lower Left:	87.35	78.55	90.30
	Lower Right:	76.45	73.15	73.90
Ladder 2:	Upper Left:	82.50	82.30	89.00
	Upper Right:	95.00	89.95	97.80
	Lower Left:	82.05	90.90	82.10
	Lower Right:	87.05	91.05	92.20
Ladder 3:	Upper Left:	84.80	88.20	90.50
	Upper Right:	82.00	83.65	91.80
	Lower Left:	88.15	85.45	86.70
	Lower Right:	81.55	86.75	86.45
Ladder 4:	Upper Left:	86.05	84.20	78.55
	Upper Right:	106.10	85.10	89.00
	Lower Left:	97.70	100.20	87.30
	Lower Right:	104.50	96.90	98.95
Ladder 5:	Upper Left:	79.70	89.05	111.25
	Upper Right:	95.25	115.20	100.25
	Lower Left:	107.50	101.65	104.10
	Lower Right:	108.70	93.15	93.00
Artifact:	Upper Left:	94.85	98.70	97.15
	Upper Right:	101.40	109.65	88.30
	Lower Left:	81.55	94.50	99.50
	Lower Right:	75.45	79.35	80.65

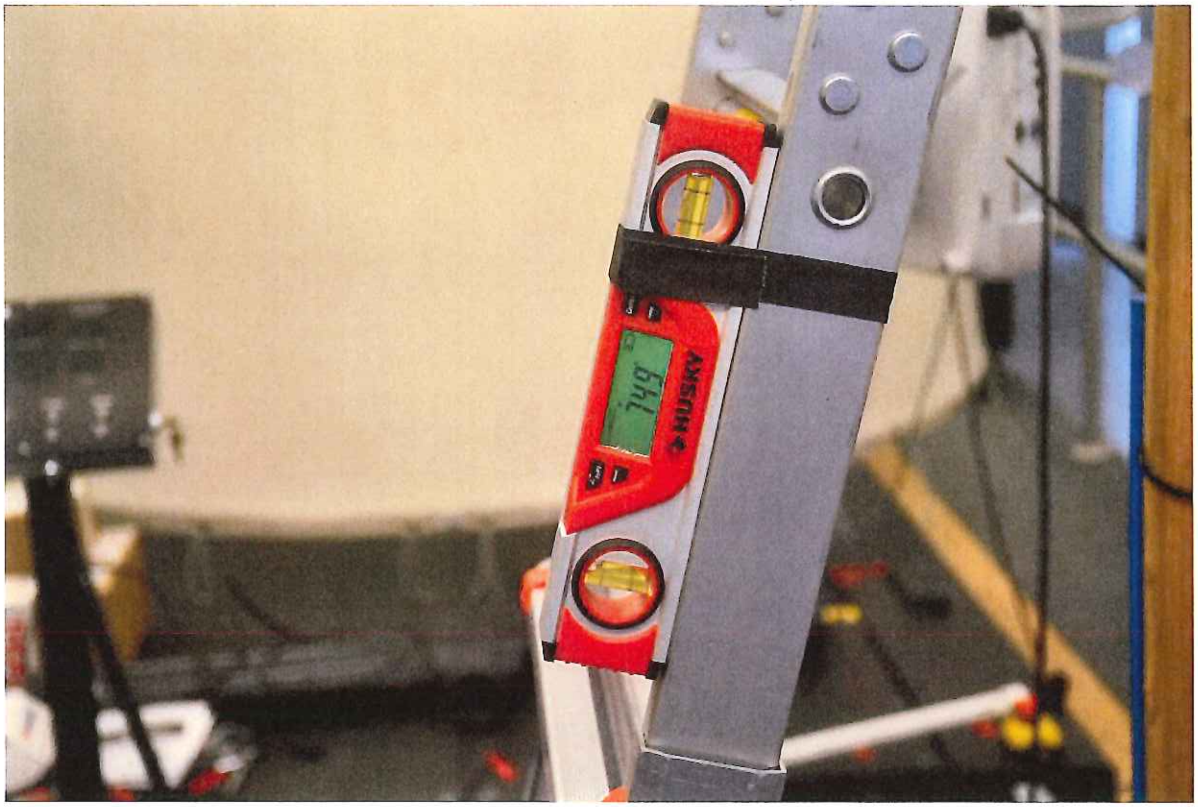
E. FORCE PLATE TESTS:

Testing was performed on an exemplar Little Giant Alta-One model 17 ladder at the Biomechanics Laboratory at San Diego State University on January 7, 2019. The purpose of these tests was to quantify the loads applied to the ladder by individuals ascending and descending. Data was gathered through the use of two strain-gage type force plates permanently mounted in the floor of the laboratory.

In order for the ladder to be set up at the proper angle against a rigid structure, a wooden scaffold was constructed on site. It was located in the laboratory such that when the exemplar ladder was placed against it at an angle of 75 degrees, each foot of the ladder would be located on a force plate. The plates were located sufficiently close to one another that this was possible.



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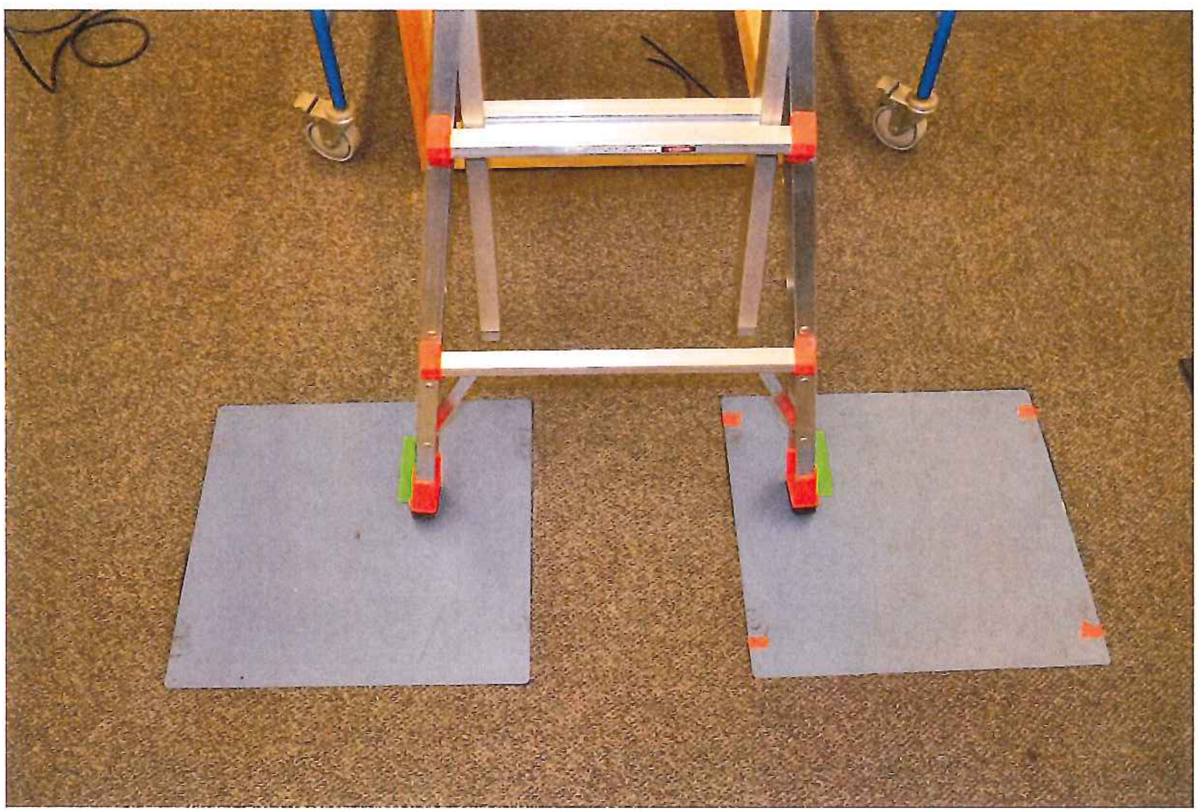
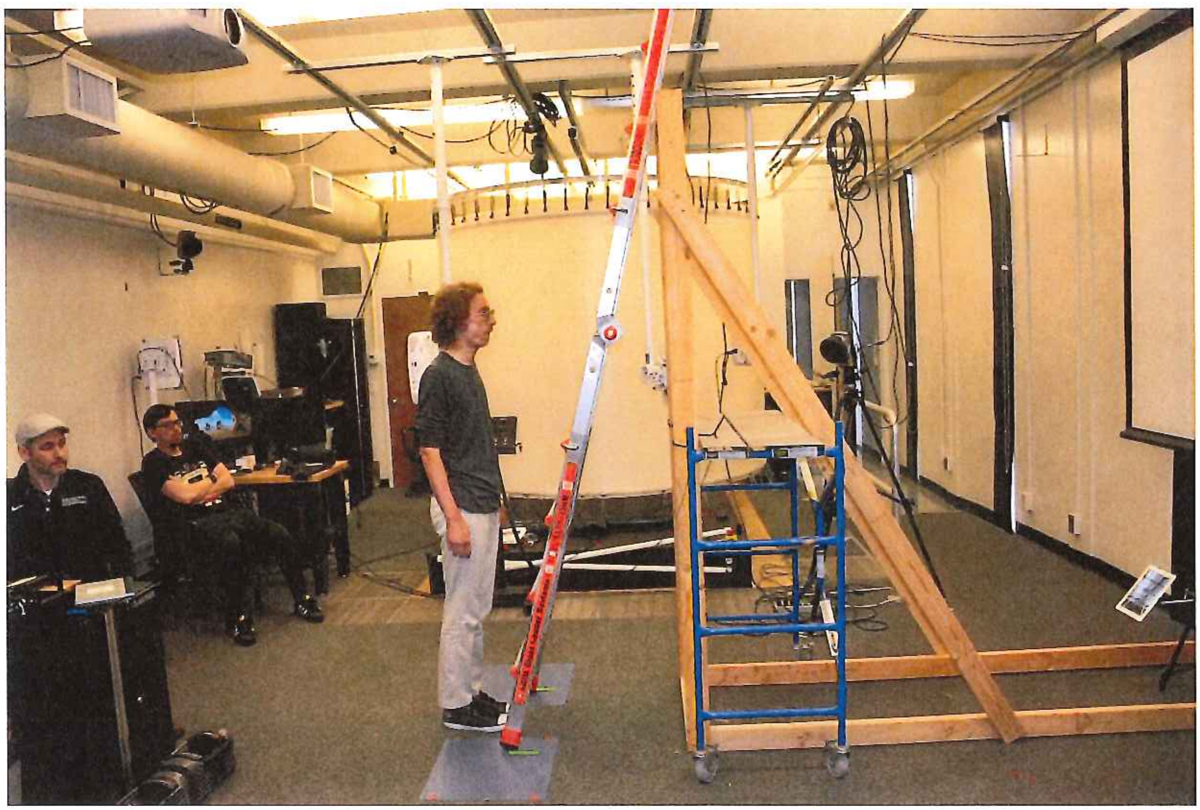
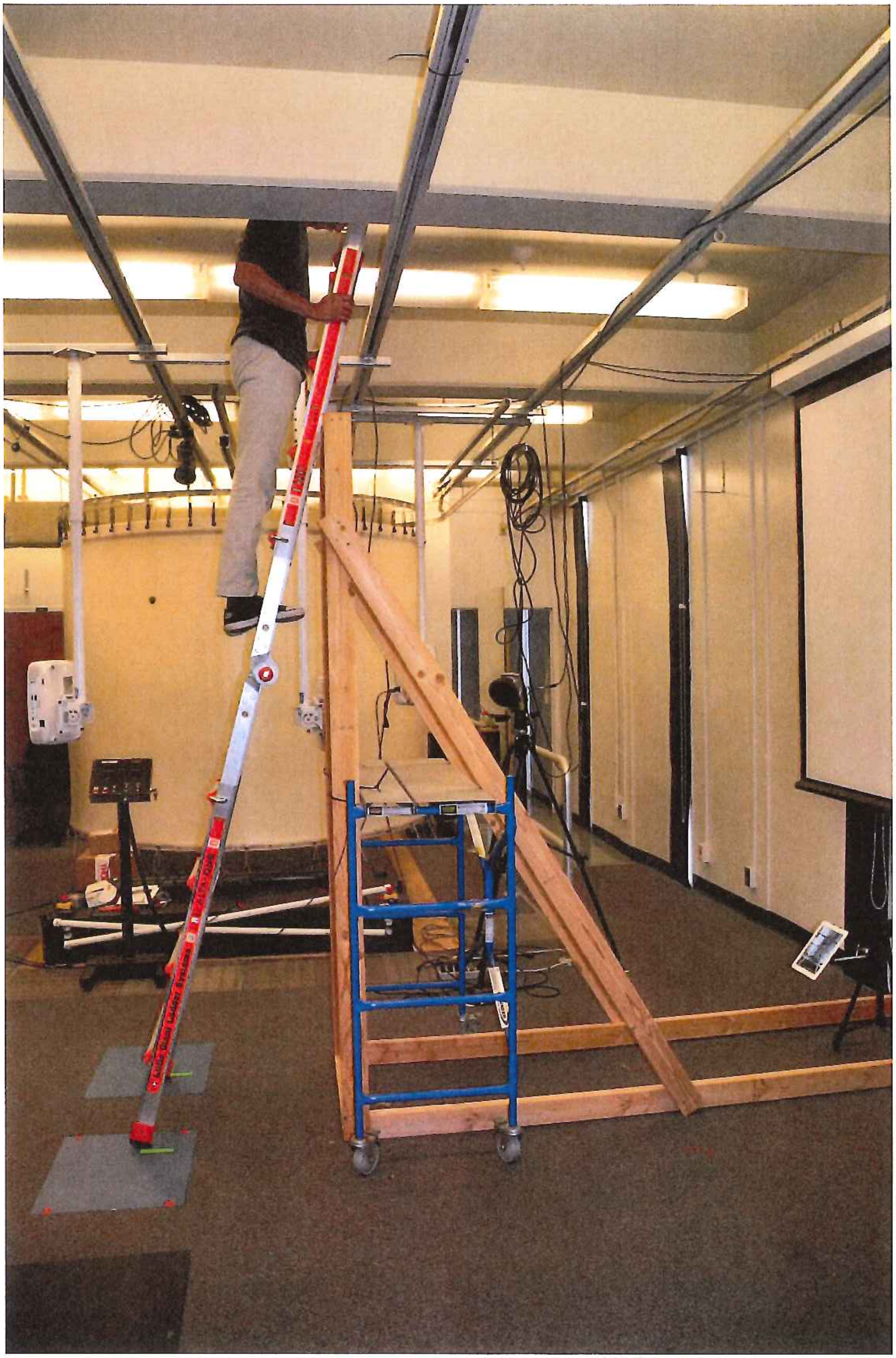


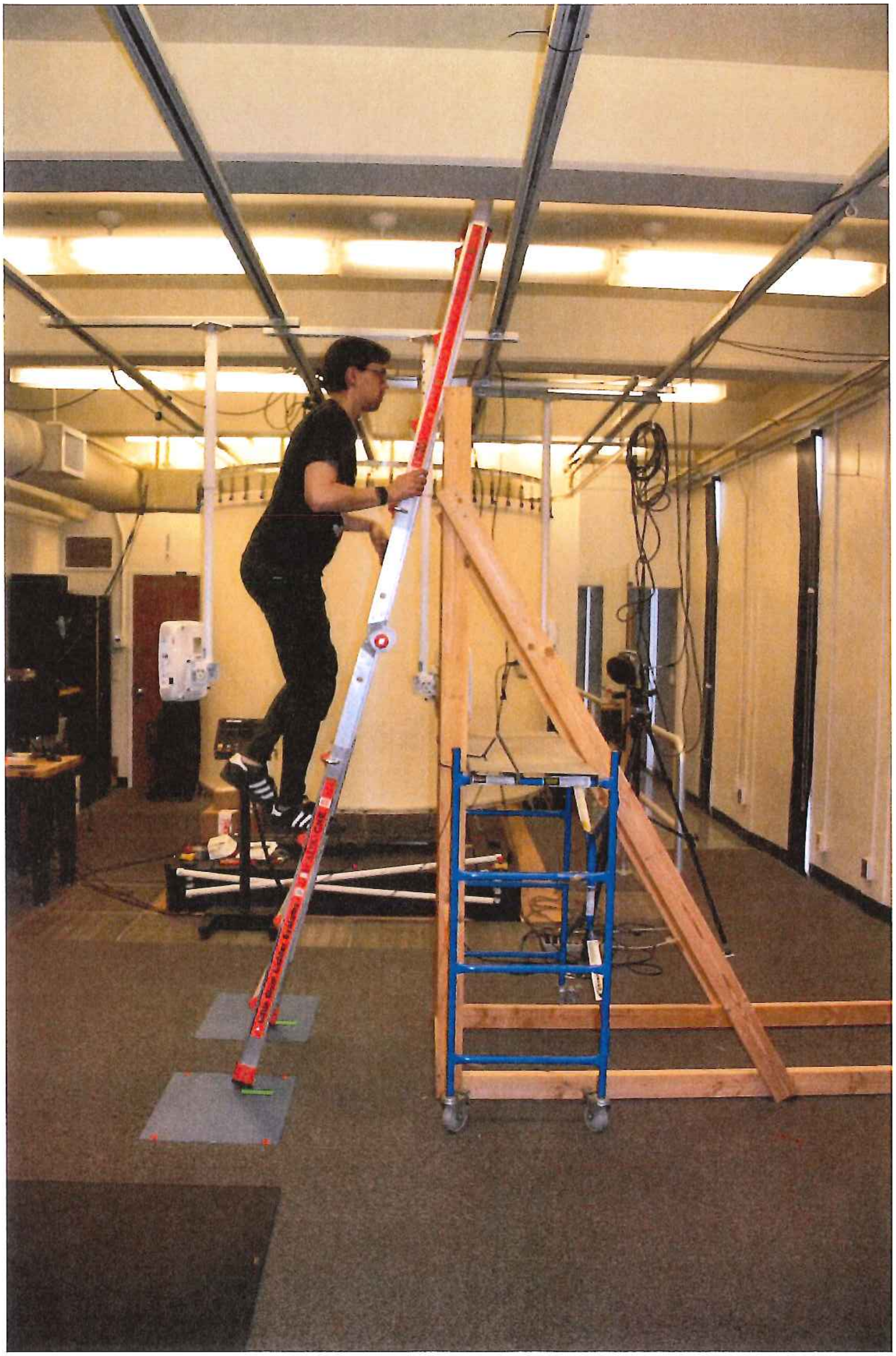
Because the height of the ceiling in the San Diego State University Biomechanics Laboratory was insufficiently tall to allow the exemplar ladder to be tested at the length being utilized by Mr. Armstrong at the time of his fall, both the upper and lower extensions were extended one rung. Due to the nature of the data being sought, this shortened length would not affect the validity or applicability of the information gathered.

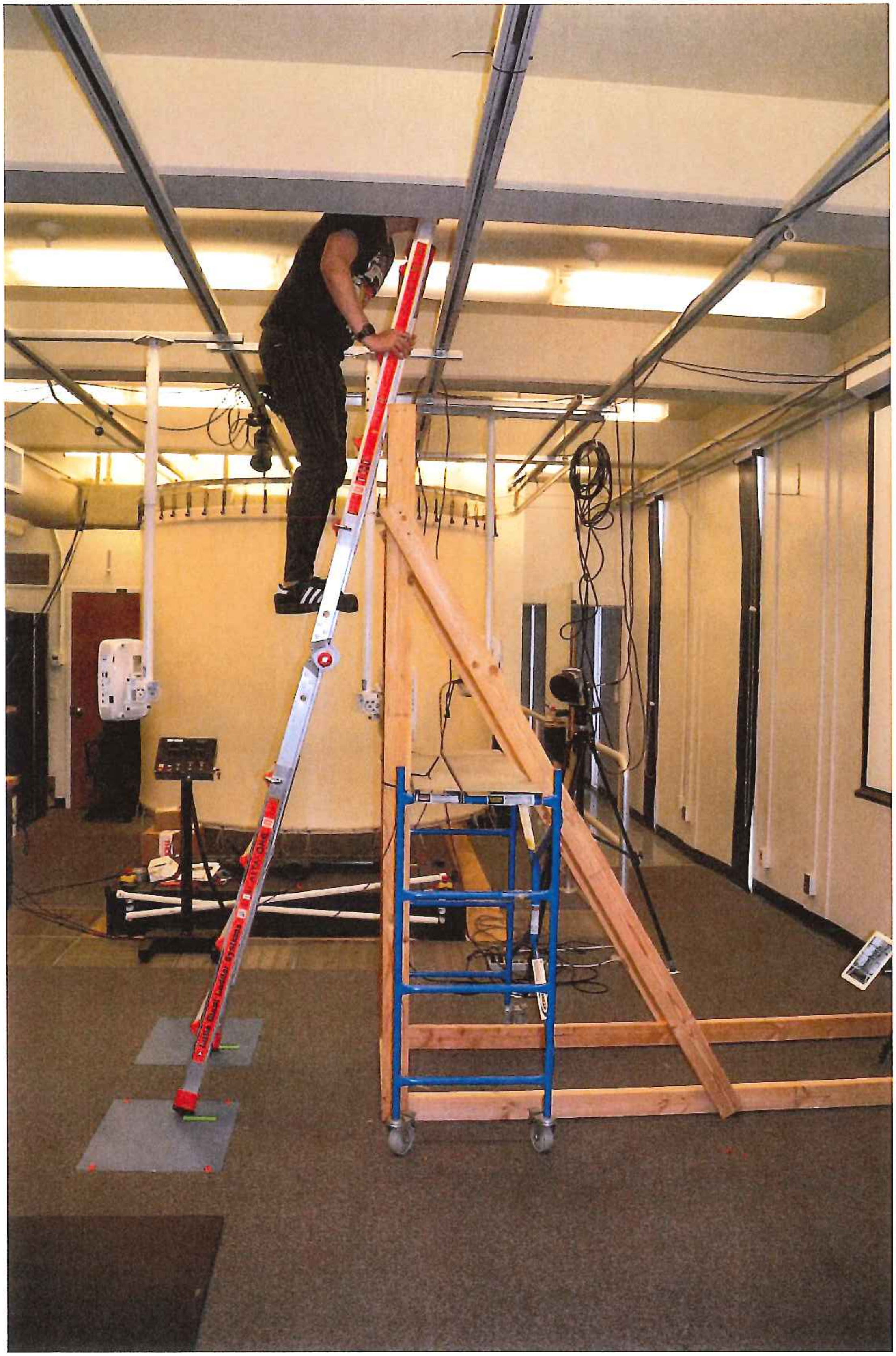
Two students were recruited to ascend and descend the ladder. Both were male, and both expressed having had some experience climbing ladders. They were instructed to climb the ladder using three point of contact technique, up to the lowest rung of the upper extension. They were then to pause on that rung for approximately five seconds, and then descend. Data was recorded from the force plates during the entirety of each excursion.

The data gathered during this testing, as well as a detailed accounting of the testing procedures, description of the testing equipment and analysis of the data is contained in the expert report of Dr. Peter Francis.









F. METALLURGY AND SPRINGS:

On January 8, 2019, an exemplar Little Giant Alta-One model 17 ladder was delivered to G2MT Laboratories, LLC, located in Houston, Texas. G2MT was engaged to perform mechanical, chemical and microscopic analysis of the springs which form part of the J-lock assemblies of the ladder. G2MT was also charged with measuring the surface roughness of the portion of the J-lock shaft that passes through the center of the spring.

A total of four J-lock assemblies were analyzed. They were removed from the exemplar ladder in the presence of the undersigned, and then further disassembled so that analysis of the springs and the shafts could be performed. The details of the testing and mensuration performed by G2MT Laboratories is contained in a separate report proffered by Dr. Angelique Lasseigne and reviewed by the undersigned.

Four J-lock assemblies were provided to Spring Expert, located in the United Kingdom for evaluation. Spring Expert performed an analysis of the springs and their properties, as well as the interaction of the spring with the portion of the J-lock shaft upon which they are located. The evaluations performed by Spring Expert and the conclusions drawn from those evaluations are memorialized in a report authored by Mark Hayes and reviewed by the undersigned.

G. ANALYSIS:

According to statistics compiled by the US Consumer Products Safety Commission, falls are the number two cause of disabling injuries and deaths in the United States each year, ranking behind only automobile accidents. Ladders, by design, serve to elevate a person, and thus expose the user of the ladder to the hazard of a fall from a height.

The Little Giant Alta-One is a Type 1 articulating ladder that can be used as an adjustable extension ladder, an A-frame ladder, or in other configurations. Mr. Armstrong was using it as an extension ladder on May 2, 2016 when he was inspecting a house at 129 Harbour Circle in Montgomery, Texas.

As described previously, the subject Alta-One contains two extendible sections that can be used to lengthen the ladder to a maximum working length of 15 feet. The extension sections slide along the rails of the base ladder and must be secured in place so that they do not move during use. Locking of each extension is achieved through the use of spring loaded locking pins in the form of a J that are inserted through openings in the rails of the extensions and then into holes in the rails of the ladder structure beneath. The holes in the extensions are oval shaped, while the holes in the base ladder rails are circular.

When the pin is fully inserted through the extension rail hole and fully into the base rail hole, the lock is engaged. A spring attached to the J and contained within the urges the end of the J inward toward the center of the ladder and through the holes. Insertion of the pin end of the J through the extension hole and into the base hole requires alignment of those

holes with one another as well as with the pin. If the pin is not aligned with the outer hole, it's tip will rest on the side of the extension rail. If the pin is aligned with the extension rail hole but that hole is not aligned with the base rail hole, then the tip of the J-lock with pass through the extension rail but rest against the side of the base rail.

Successful insertion of the J-lock pin through the extension rail and fully into the hole in the base rail is therefore dependent on a number of factors. The force imparted by the spring onto the J-lock must be sufficient to overcome the resistances created by friction between the surface of the pin and the inner surfaces of the extensions rail hole and the base rail hole. It must also be sufficient to overcome misalignments of the holes, and to hold the pin in place during use and movement of the ladder.

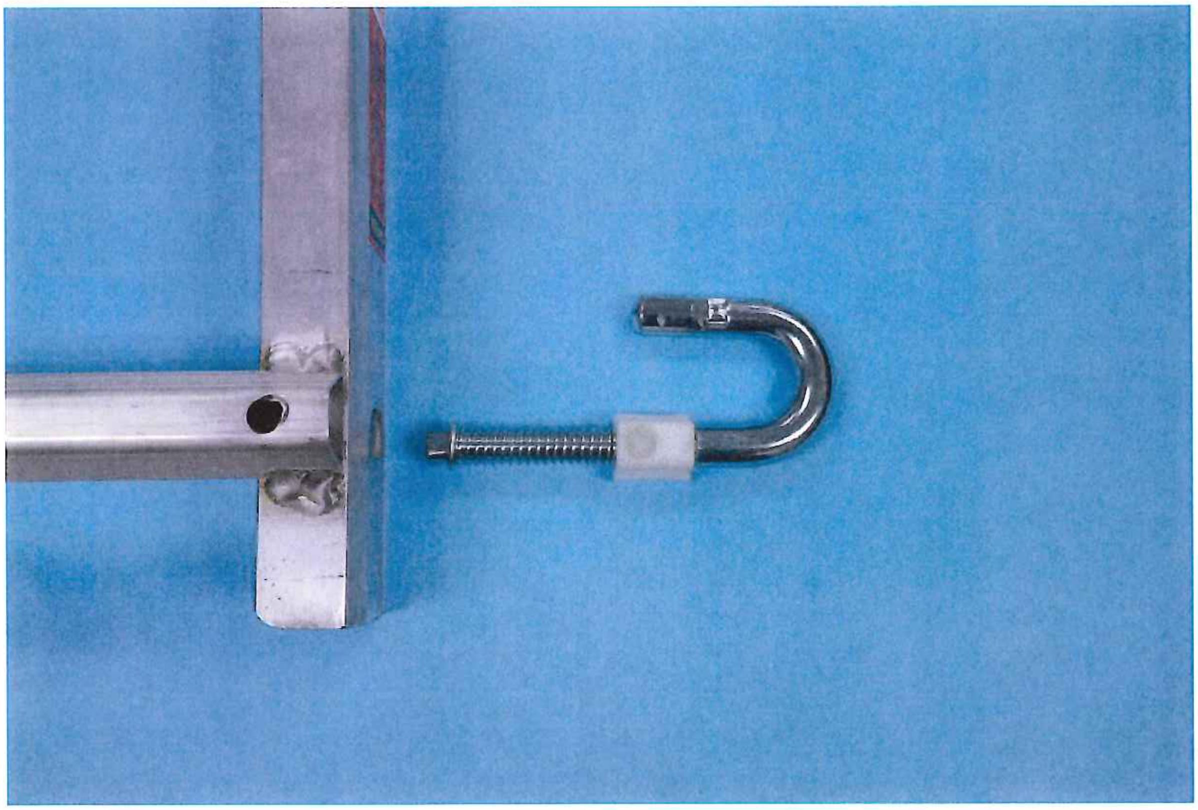
The tip of the J-lock pin must exhibit a geometry that facilitates insertion of the pin into the holes. To do so, it must minimize the probability of the tip of the pin being restrained due to contact with the inside surface of the extension rail hole, the inner surface of the base rail hole, the edges of either hole or the circular ring created around the base rail hole by the swaging operation used to attached the rung to the rail during manufacture. When confronted with compressive forces created by the weight of the extension acting downward on the pin while it is in contact with the lower edge of the base hole, the geometry of the pin tip in conjunction with the applied spring force must still be capable of achieving complete insertion.

False locking is a condition whereby the locking system of an extension ladder is partially, but not fully, engaged. It presents the appearance, both visually and tactilely, that the extension is completely locked to the base when in reality, complete locking has not been achieved. In the first set of tests performed on exemplar Little Giant Alta-One ladders, two modes of false locking were identified as occurring. The first involves insertion of the J-lock pin through the extension hole but coming into contact with the base rail just above and in contact with the swage ring around the base hole. In this condition, the tip of the pin is forced by the spring against the side of the base rail, and the pin rests on the ledge created by the swage ring.

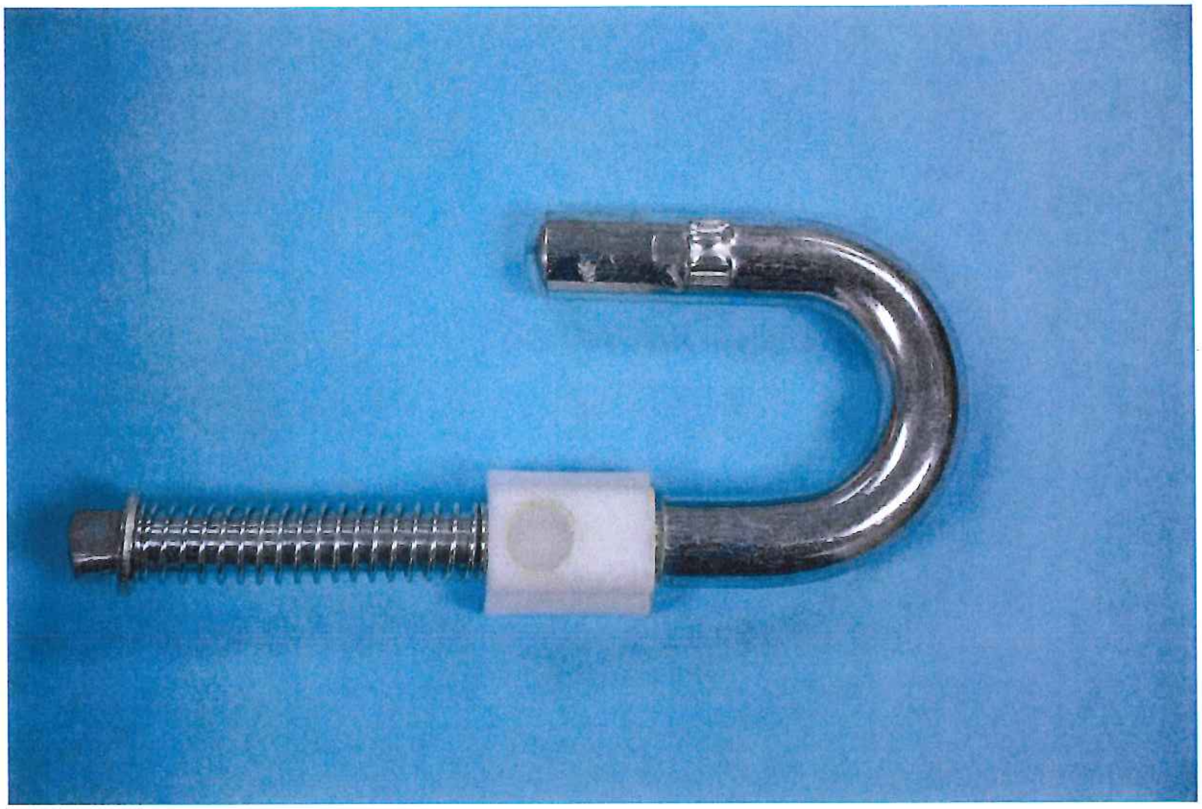
The second identified mode of false locking on the Alta-One likewise involves penetration of the J-lock tip through the hole in the extension. However, in this case, the tip comes to rest against the edge of the swage ring at the bottom of the hole but on the top ledge of the ring. The force of the spring holds the tip of the lock pin against the upper edge of the swage ring, while the upper surface of the inside of the extension hole exerts a compressive force on the top of the pin. In both cases, the J-locks are partially, but not completely inserted. As the testing clearly demonstrated, the false locks permit the placement and movement of the ladder with the extension remaining elevated. Only when a sufficiently large downward force is imparted to the upper extension is the false lock overcome and the extension descends.

Design:

The J-Lock is a combination of four components: a steel bar, a spring, a plastic retainer, and a washer. Two J-lock assemblies are contained within the hollow top rail of each extension. The bar itself is bent into a hook or "J" shape, and features two diameters. The diameter of the pin portion of the shaft that is intended to be inserted through the extension and base holes in order to lock the two together is 0.563 in diameter, with a tolerance of plus or minus 0.015 inches. The entire portion of the J-bar that exhibits this diameter is not tapered. The nose of the bar has a radius of 0.375 inches. Located 0.975 inch from the tip of the bar are two flat tabs stamped into the bar that serve as stops to limit the distance that the bar can travel through the extension hole and into the base rail hole. The surface of the J-bar in the 0.563 inch diameter section and the rounded tip of the shaft bear a polished finish.



The remaining, straight portion of the J-bar as designed measures 3.50 inches in length and has a diameter of 0.375 inches, plus or minus 0.010 inches. The surface of the bar in this area is not polished and has a textured surface indicative of it having been turned on a lathe or having had a similar material removal process performed. The plastic retainer, spring and washer are placed over the J-bar in this area before the tip of this end of the bar is subjected to a stamping operation which creates a flat that captures the washer and does not let it leave the shaft. This keeps the retainer, spring and washer on the J-bar. The 0.375 inch intended diameter of the J-bar serves as a guide for the spring which surrounds it.



As previously documented, the holes in the extension rails of the artifact ladder, and also the exemplar Little Giant Alta-One ladders, are oval in shape. They are cut into the rails perpendicular to the rail surface, meaning that there is no bevel. The top and bottom inside surfaces of the cut holes are parallel. The inside surfaces of the cut holes are also not polished or smoothed. This creates a rough surface on the inside walls of the holes. The holes on the artifact ladder were measured, with the small dimensions (flat side to flat side) ranging from 0.573 inches to 0.578 inches. The large diameter portions of the J-bars were also measured, and ranged from 0.555 to 0.556 inches. This means that the clearance between the pin and the hole was only 17 thousandths of an inch.

With such a tight fit, the surface of the J-bar will contact the inner surface of the extension hole when the J-bar is being inserted to lock the extension to the base. Contact between two surfaces results in frictional resistance to motion. So as the pin is attempting to insert itself into the hole under the force of its spring, that motion into the hole is being resisted by the friction between the surface of the pin and the inside of the hole, effectively reducing the spring force.

Once the leading tip of the J-bar passes through the extension rail hole, if it does, it encounters the hole in the base rail, where an additional frictional resistance, this time between the inside of the base rail hole and the surface of the J-bar, is encountered. This further opposes the spring force. Also, the base rail hole is bounded by a raised ring of aluminum that is created by the swaging operation used by the ladder's manufacturer to

connect the rungs of the base to the rails. Based on the drawings produced by Wing Enterprises, this ring can protrude horizontally from the vertical surface of the outside of the base rail by 0.125 inches. The protrusion creates an edge that a portion of the circumference of the J-bar tip can rest against in a false lock condition.

The false lock testing of exemplar ladders clearly validates the thesis that the J-locks incorporated into the Little Giant Lata-One ladder can, in conjunction with the geometry of the base rail holes and the extension rail holes, create a false locking condition that can withstand the ladder being moved and placed against an object. This false locking condition remains in place as a climber ascends the ladder until sufficient downward force is applied to overcome the interference and spring force creating it.

The subject Little Giant Alta-One is defective in that a false locking condition can occur due to multiple design deficiencies. Full engagement of the J-lock is primarily a function of two factors: the geometry of the tip of the J-bar and the force of the spring urging it through the extension rail hole and into the base rail hole.

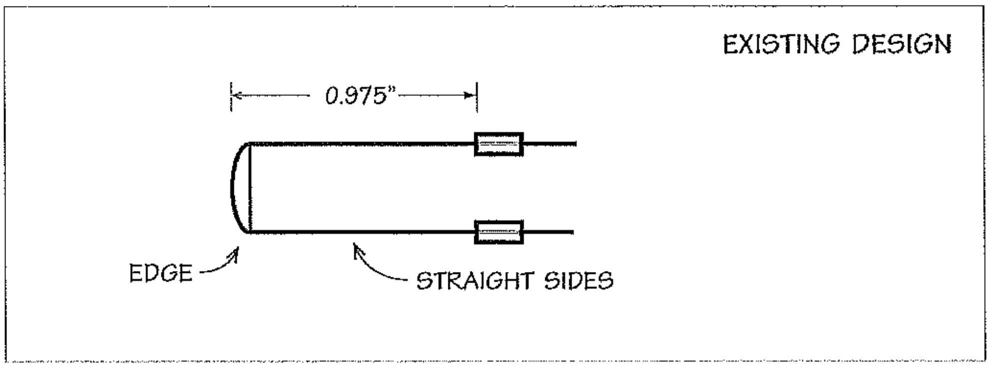
Alternative Designs:

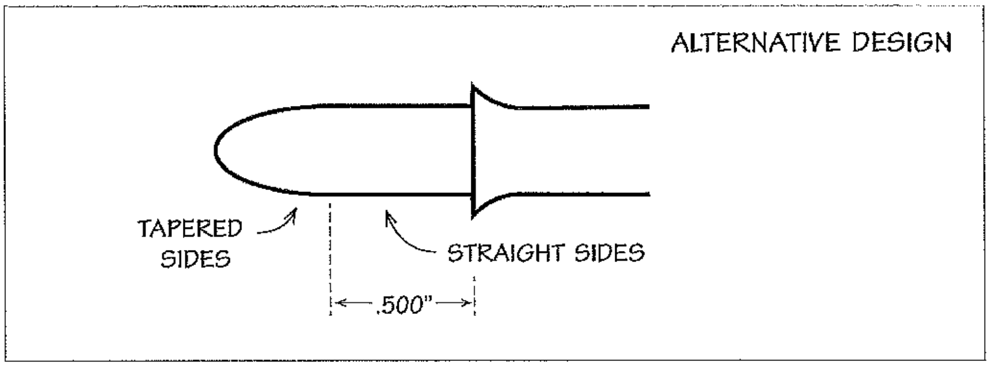
The first defect is the shape of the J-bar end that is intended to pass through a hole in the extension rail and into a hole in the base rail, securing the extension to the base. The tip of the bar is only slightly rounded, with a 0.375 radius on the end of a 0.563 inch (design dimension) round shaft. An edge is created where the radius meets the non-tapered shaft. This edge, when forced into contact with the base hole swage ring, creates the false lock.

The almost blunt tip of the J-bar does little to guide the J-bar into the intended location because it is so shallow. The tip of the J-bar shaft could have and should have been manufactured with a profile akin to that of a round-nose bullet. The leading area of the tip would be significantly reduced and the sides of the J-bar tapered to facilitate its insertion through the extension rail hole and into the base rail hole. No edge would be present as is found on the J-bars of the artifact and exemplar Alta-One ladders.

Such a profile is found on military "ball" ammunition used by the United States military. The design facilitates insertion of the bullet into the chamber at the rear of a gun barrel to prevent jamming. The tip of the J-lock would effectively become a ramp. For the Alta-One, the tapered/curved profile can extend half way or more toward the tabs stamped into the shaft to limit its travel into the extension hole. The thickness of the aluminum that forms the extension rail, plus the maximum distance between the inside of the extension rail and the outer edge of the base rail swage ring is less than 0.50 inch. It is desirable for the extension hole to rest on top of a non-tapered surface, so the proposed alternative design would call for a taper to extend from the tip of the J-bar to a point .475 inch behind it before it transitions to a straight sided shaft. An illustration of this alternative design is illustrated in Figure 1.

FIGURE 1

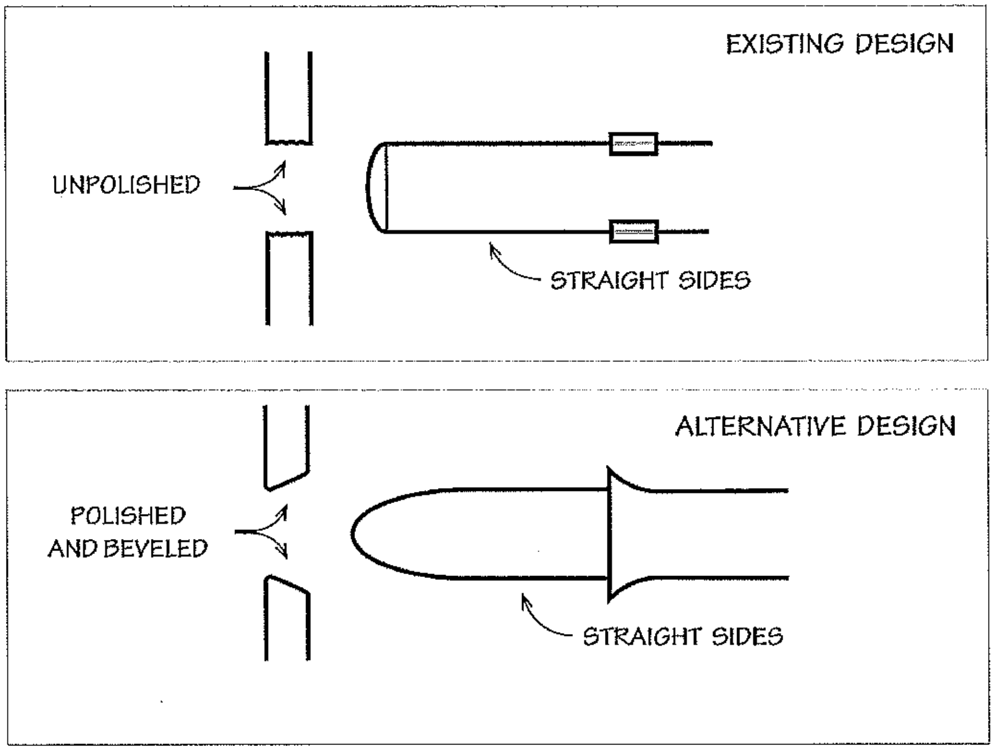




Other design modifications could have and should have been employed on the Little Giant Alta-One to prevent false locking. As stated earlier, contact between the surface of the J-bar and the inside surface of the extension hole create a frictional force that acts opposite to the spring force attempting to insert the J-lock. The magnitude of this opposing force is dependent on the coefficient of friction between the two surfaces in contact. The steel J-bar is polished in this area, but the inner surface of the hole is not. Polishing the inner surface of the hole would lower the coefficient of friction and thus the frictional resistance to the spring force.

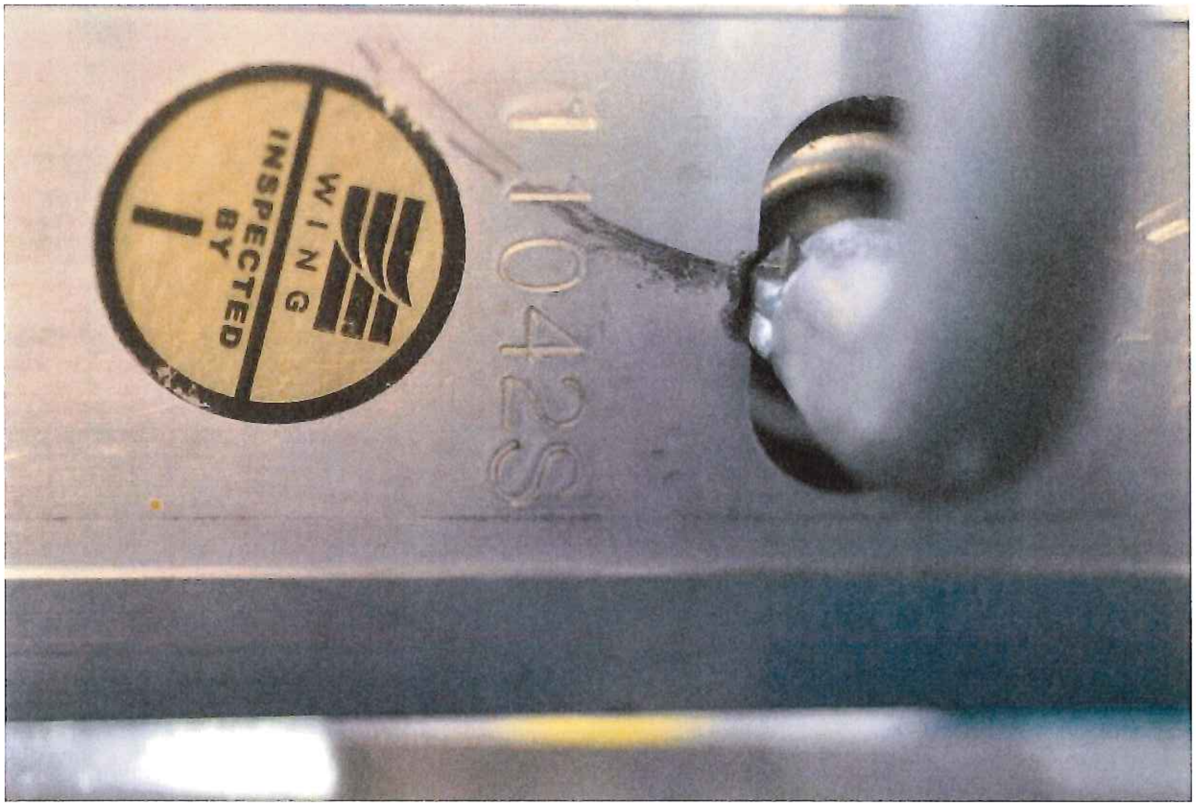
Another modification to the extension rail hole to aid in the insertion of the J-lock and reduce the probability of a false lock occurring is to bevel or ramp the inner surface of the extension hole. This would prevent the tip of the J-lock from encountering a sharp edge that would interfere with its insertion. Recall that the diameter of the J-bar is within as little as 0.17 inch of the size of the opening in the extension rail. During testing, the tip of the J-lock repeatedly impacted the edge of the opening in the extension rail during routine attempts to engage the J-lock. Modifications to the extension rail hole are illustrated in Figure 2.

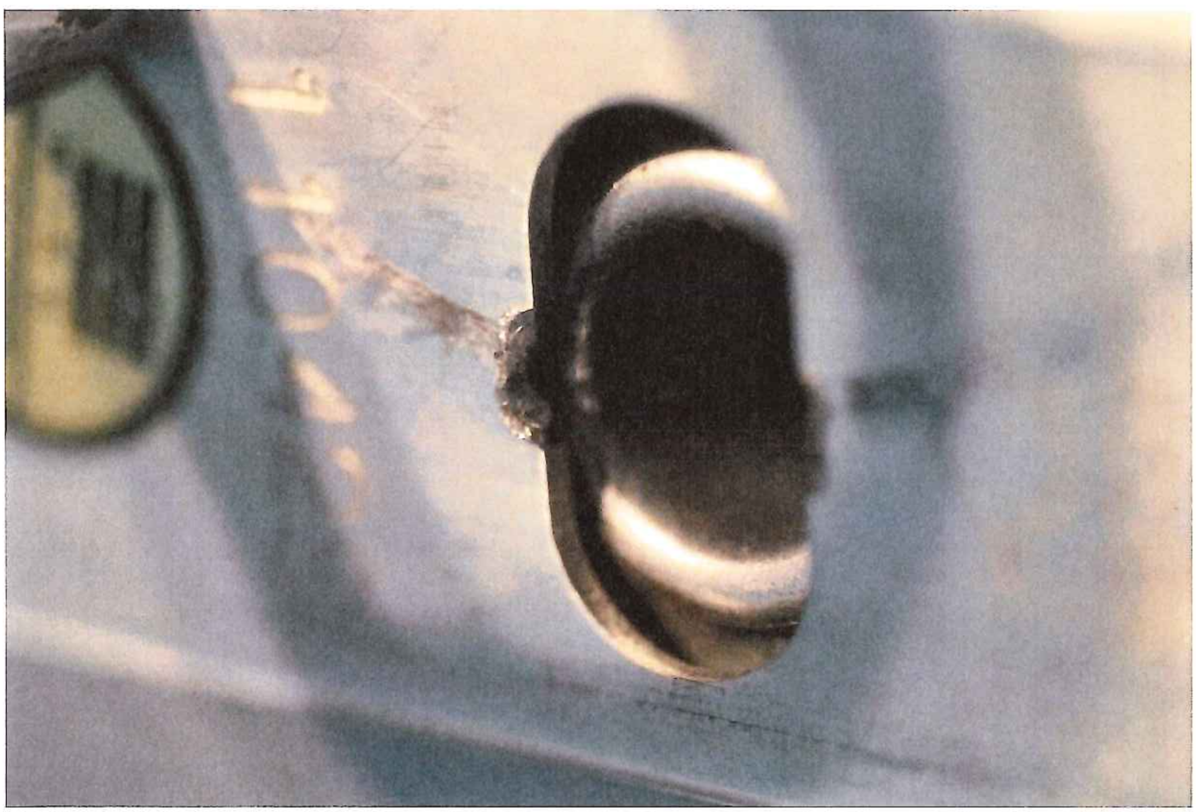
FIGURE 2



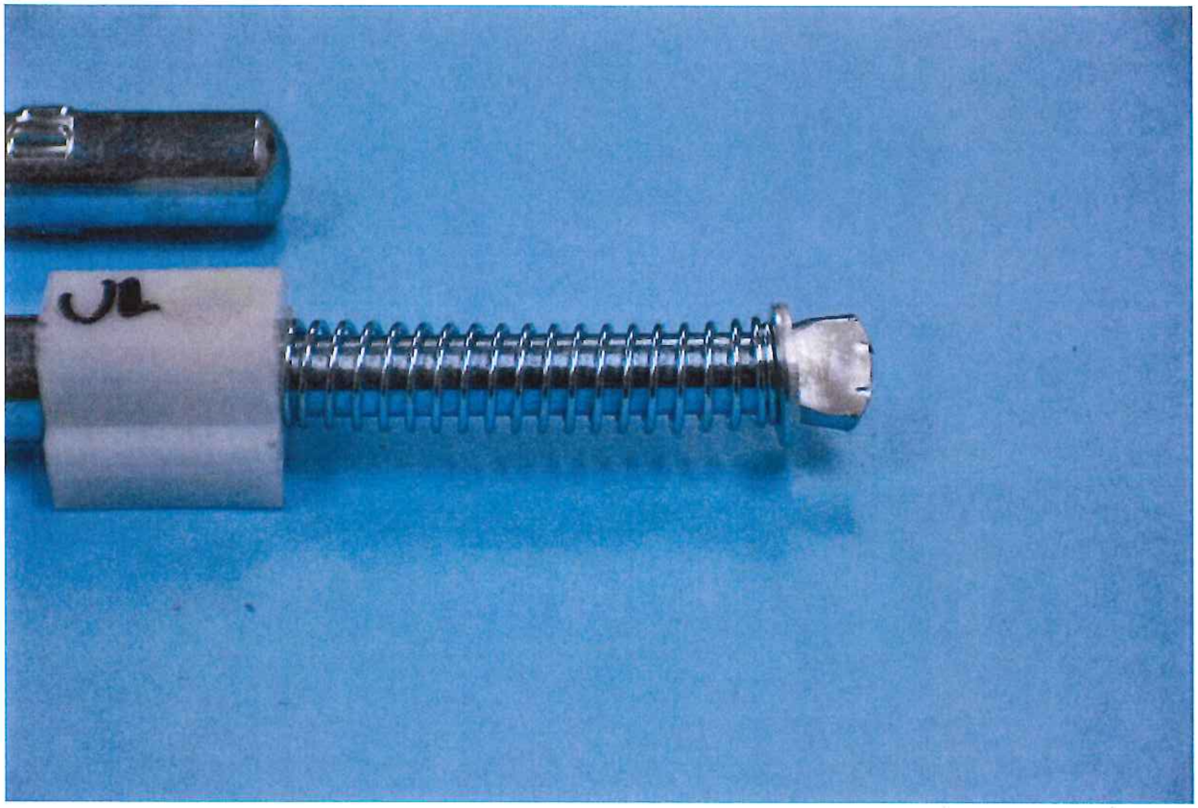
During examination of the Subject Little Giant Alta-One ladder that Mr. Armstrong was using when he fell, deformed areas at the top and bottom of each extension rail hole were noted. This deformation was caused by the two tabs stamped into the steel J-bar to limit its travel into the hole striking the aluminum rail of the extension. Aluminum is substantially more ductile than steel, which is why the aluminum is deformed but not the steel. The deformation of the extension rail hole could have been avoided by using an alternative design that employs a shoulder or washer at the location of the tabs. The larger surface of the washer or shoulder face would distribute the load being imparted to the extension rail over a far greater area. This would prevent the damage seen on the artifact ladder caused by the steel tabs.

When the Little Giant Alta-One ladders being tested false locked, the tip of the J-lock rested on the inner lip of the swage ring present around the base rail hole. It was held in place by the J-lock spring, which applied a force pushing the tip into the ring, as well as by the weight of the extension being applied to the top of the J-bar through contact of the inside of the extension hole with the top of the J-bar. This defective condition can be ameliorated by eliminating the swage ring. Alternative methods of attachment such as welding could have and should have been utilized, followed by a grinding operation to smooth the surface and bevel the edge, facilitating J-lock insertion and eliminating the very location and geometry where the false lock occurs.





Retention of the spring on the J-bar is accomplished through the use of a watcher place on the spring that sandwiches the spring between the plastic retainer and the washer. The end of the J-bar is then pressed, creating a geometry that captures the washer, and thus, the spring. This method of retention results in spring force variability, as the washer can and does rock back and forth on the crushed end of the J-bar. The surface of the washer in contact with the spring is not always oriented perpendicular to the long axis of the spring. The spring could have been retained on the J-bar by flattening the end of the bar so that the washer would remain flat relative to the spring end.



Manufacturing:

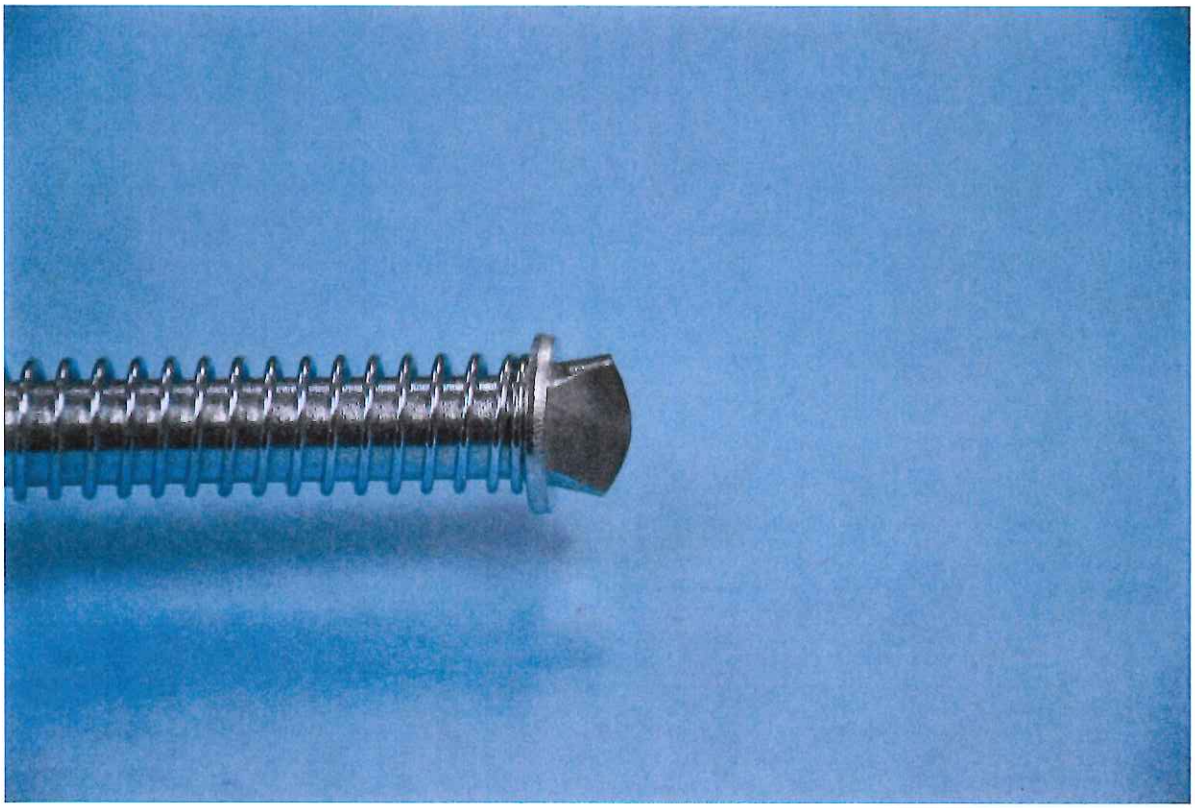
The second critical factor influencing engagement of the J-locks is the force of the spring urging the J-bar into the intended openings in the extension rail and the base rail. Physical contact between the J-bar and other components of the ladder create forces that act in opposition to the spring force. Likewise, contact between the spring itself and its surrounding environment also reduces the force applied by the spring to engage the J-lock.

On an assembled J-lock, the spring is located around the smaller diameter section of the J-bar. This length of the J-bar is not polished, resulting in it having a rough surface created by the machining operation that reduced the diameter of this section of the bar. As the spring is compressed, it buckles, and it contacts the rough surface of the J-bar. Friction between

the spring coils and the surface of the J-bar creates resistance to the spring extending, thus limiting the force available to drive the J-bar into full engagement.

The roughness of the J-bar surface is not consistent, as documented in the G2MT report, leading to variability in the spring force engaging the J-lock. Variability is reflected in the measurements of the spring forces of each J-lock on the artifact ladder. The rough surface of the J-bar in the area of the spring is a manufacturing defect, as it is created by the turning operation performed on the J-bar to reduce its diameter in this area. Wing Enterprises drawing 50952 contains a requirement that the 0.375 radial surface "must be smooth and free of cracks". Deposition testimony by principles of Wing Enterprises interpret this drawing as requiring the 0.375 inch diameter shaft over which the spring fits to be smooth. The surface roughness of the J-bar is a manufacturing defect in that the manufacturing process rendered is not smooth.

In the event that Wing Enterprises did not specify that the surface of the J-bar in the spring area be made smooth, then it is a design defect as well. The rough surface finish of the J-bar can be seen in the photographs on the previous page and below, beneath the spring.



A second manufacturing defect is present on the J-lock bar. When measured by Spring Expert, it was noted that the diameter of the smaller diameter section that exhibits the rough surface is out of tolerance. The diameter of the shaft is smaller than the minimum

acceptable diameter, according to the dimensions and tolerances reflected on the drawing. Details of the measurements can be found in Spring Expert's report.

Either of the manufacturing defects, the rough surface of the bar upon which the spring is mounted as well as the undersized diameter of the bar, contribute to reducing the spring force applied to the J-lock. The insertion force of the spring is lessened by frictional resistance caused by contact of the spring with the rough surface, and also by deformation of the spring permitted by the smaller diameter of the guide shaft. Diminished spring force contributes to fall locking of the J-lock, as there is less force pushing the lock through the hole in the extension rail and into full engagement.

H. CONCLUSIONS:

In addition to those conclusions contained in the analysis above, the following are held to a reasonable degree of engineering certainty:

1. The J-locks of Little Giant Alta-One ladder are capable of being placed into a false lock condition. Two modes of false locking have been identified.
2. The false lock condition of the J-locks is not readily apparent during a visual inspection of the ladder with the J-locks in a false locked state.
3. The false lock condition allows the ladder to be set up and at least partially climbed without revealing its condition to the climber.
4. The false locked condition of the J-locks on the upper extension of the Alta-One is overcome by the application of force by a climber's foot or hand on the upper extension. When the climber's hand or foot reaches the extension, he or she is elevated and exposed to a fall hazard.
5. Release of the false locked J-locks allows the upper extension to descend with the climber on the ladder. This can cause the climber to fall from the ladder and suffer severe injuries or death.
6. The ability of the J-locks on the Alta-One to false lock is due to design and manufacturing defects in the J-lock and the ladder.
7. The design of the tip of the J-bar is defective and contributes to the onset of J-lock false locking.
8. The design of the ladder extension, specifically, the holes through which the J-lock is intended to pass, is defective.
9. The design of the base ladder, specifically the swage ring created during attachment of the rungs to the rails, is defective.
10. Alternative designs for the J-bar geometry, extension holes and rung to rail attachment on the base were technically feasible at the time of the Alta-One's design. These alternative designs were also economically feasible.
11. The J-locks of the exemplar Little Giant Alta One ladder were found to contain manufacturing defects which could contribute to false locking of the J-locks.
12. The surface of the J-bar in the area of the spring is defectively manufactured. It has an inconsistently rough surface created by a machining operation that affects movement of the spring along it.

13. The diameter of the J-bar in the area of the spring is out of tolerance compared to the part drawing. Its diameter is undersized. This allows the spring to deflect to a greater degree than it would on a larger diameter shaft.
14. Alternative or additional operations would ameliorate the rough surface of the J-bar, including a polishing operation consistent with that performed on the other surfaces of the J-bar.
15. The J-bar could have and should have been manufactured within the specified tolerances.
16. The Little Giant Alta-One ladder is defective and unreasonably dangerous for its intended use.

Please do not hesitate to contact me as the need arises.

Respectfully Submitted,

Peter J. Poczynok, P.E.